

WHAT IS A MATHEMATICAL CONCEPT?

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The main goal of my ongoing research project is to find out how human beings form mathematical concepts. This is a very complicated matter, and has to be analyzed in several steps. The very first step is to clarify what a concept is, and then try to characterize the mathematical concepts. My starting point will be some observations of how various people use the word 'concept'.

THE CONCEPT OF A CONCEPT

I once gave this task to student teachers in connection with the didactics of mathematics in primary school: Pick out two mathematical concepts and describe how you would proceed to make your learners grasp the concept. The answers varied of course much in quality, but what is most interesting in connection with my project is the various choices of concepts to work on, and what this tells about how the word *concept* is commonly used. Here are some examples (given as concept₁/concept₂):

number/geometry; addition/subtraction; number/circle; estimation of quantity/shapes in two dimensions; cardinal number/ordinal number; comparing/sets; understanding of cardinality/classification; number/space and shape.

In the following discussions with the students, it became clearer to me than before that many people just mean a word or an expression when they use the word *concept*. This indicates a very poor understanding of what a concept is, and this may draw the attention away from what is essential in learning concepts.

I will discuss the didactical implications of the teacher's understanding of what constitutes a concept.

Mathematical concepts

It is very difficult to define what mathematical concepts are, in a way that separates them from all other concepts, and the necessity of this is questionable. It might still be possible to say something that could draw some limits. In addition, when we see examples as *geometry* or *shape* as proposed from the student teachers mentioned above, we realize that we have to deal with a *hierarchy* of mathematical concepts.

I will also discuss the difference between a mathematical concept as conceived by a mathematician and by a schoolchild, and the steps in forming the important concepts.

References:

- Brown, J. R. (1999). *Philosophy of Mathematics*. London and New York: Routledge.
Ernest, P. (Ed.). (1994). *Mathematics, Education and Philosophy*. London: Falmer.